



Environmental Assessment

**Improvement of Access at Hydrology Monitoring Stations
In Big Cypress National Preserve**

May 2001

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I. Purpose of and Need for the Project

PROPOSED ACTION

The National Park Service proposes to improve helicopter landing sites at six hydrologic monitoring stations in Big Cypress National Preserve. The selected sites encompass five management units of the Preserve, all of which would be within the portion of the Preserve which is inside the boundaries of Collier County (see Region and Vicinity maps).

Five alternatives for addressing the proposed action were evaluated in this document, in addition to the no-action alternative. The alternatives were developed with consideration of NPS management policies, legislative mandates, approved park planning documents and employee and public safety.

PURPOSE OF THE ACTION

The purpose of the proposed action is to improve helicopter landing conditions at six hydrologic monitoring stations within the Preserve. Improving the sites will enhance safety, minimize impact to the natural resources, improve efficiency of monitoring and collecting water samples as part of the hydrologic monitoring program in the Preserve, and provide for more economical use of costly helicopter and pilot resources.

NEED FOR THE ACTION

The need for this action has been evolving for several years. Prior to the establishment of the Preserve, hydrologic information was limited to water stage data recorded at several nearby sites in Everglades National Park, stage and discharge data obtained by the U.S. Geological Survey along the Tamiami Trail, and several independent studies for special purposes. In 1988, eleven sites were established to monitor stage and water quality. In 1990, the Preserve and the South Florida Water Management District (the District) initiated a cooperative agreement which provided for a substantial upgrade in both equipment and quality of data collection in the Preserve and for compatibility and exchange of water data between the two. In 2000, six more hydrologic monitoring sites were added to the network, and the cooperative agreement with the District was renewed for five more years.

The previously existing hydrologic monitoring network in the Preserve met a minimum requirement for general hydrologic information needs, however, maintaining a program that will meet the future water monitoring needs of the Preserve and support the numerous regional hydrologic efforts requires periodic reevaluation and expansion. Preserve staff have continued to examine the existing monitoring network, to identify gaps in information that would be useful to managers both in the Preserve and regionally for decision making. Staff have also reviewed and prioritized locations for installation of new sites if funding became available. Following this justification, four new stations were established using minerals management funds, and placed in the vicinity of the Sunniland Trend, to provide stage and water quality data that would be useful for monitoring oil and gas exploration and production in the Preserve. Two additional monitoring stations were located in the Stairsteps Unit, in the southern portion of the Preserve, where there was a deficiency in available hydrologic data to make informed decisions about airboat use and management of Cape Sable Seaside Sparrow habitat.

The hydrologic network today consists of twenty sites at which both water stage and water quality are measured. They have been strategically placed to measure both overall baseline conditions in the Preserve and impacts to the water from internal and external threats. The stations are financially supported by the South Florida Water Management District and operated by the Preserve under the conditions of the renewed cooperative agreement. Under the agreement, the Preserve collects water stage data and water quality samples monthly following a rigorous Quality Assurance Project Plan approved by the District. The District provides extensive laboratory analysis on specific water quality parameters for the Preserve (See Table 1.). The District also processes the water stage data collected by the Preserve. All hydrological data are made available to public and private entities on the District's stage and water quality databases.

Problems have arisen from the methods used to complete the monthly hydrologic and bi-monthly sampling at the Preserve. Access to 16 of the 20 monitoring stations is by helicopter (see Figure 1.). These off-site landings are improved only by manual removal of the vegetation that may interfere with the safe operation of the aircraft. This usually means cutting down the vegetation to eliminate the potential for contact with the helicopter tail rotor. Landing sites have been selected where tree removal is largely unnecessary, and only the woody and herbaceous vegetation that would be consumed in a naturally occurring or prescribed fire are cut with machete or small weed whip.

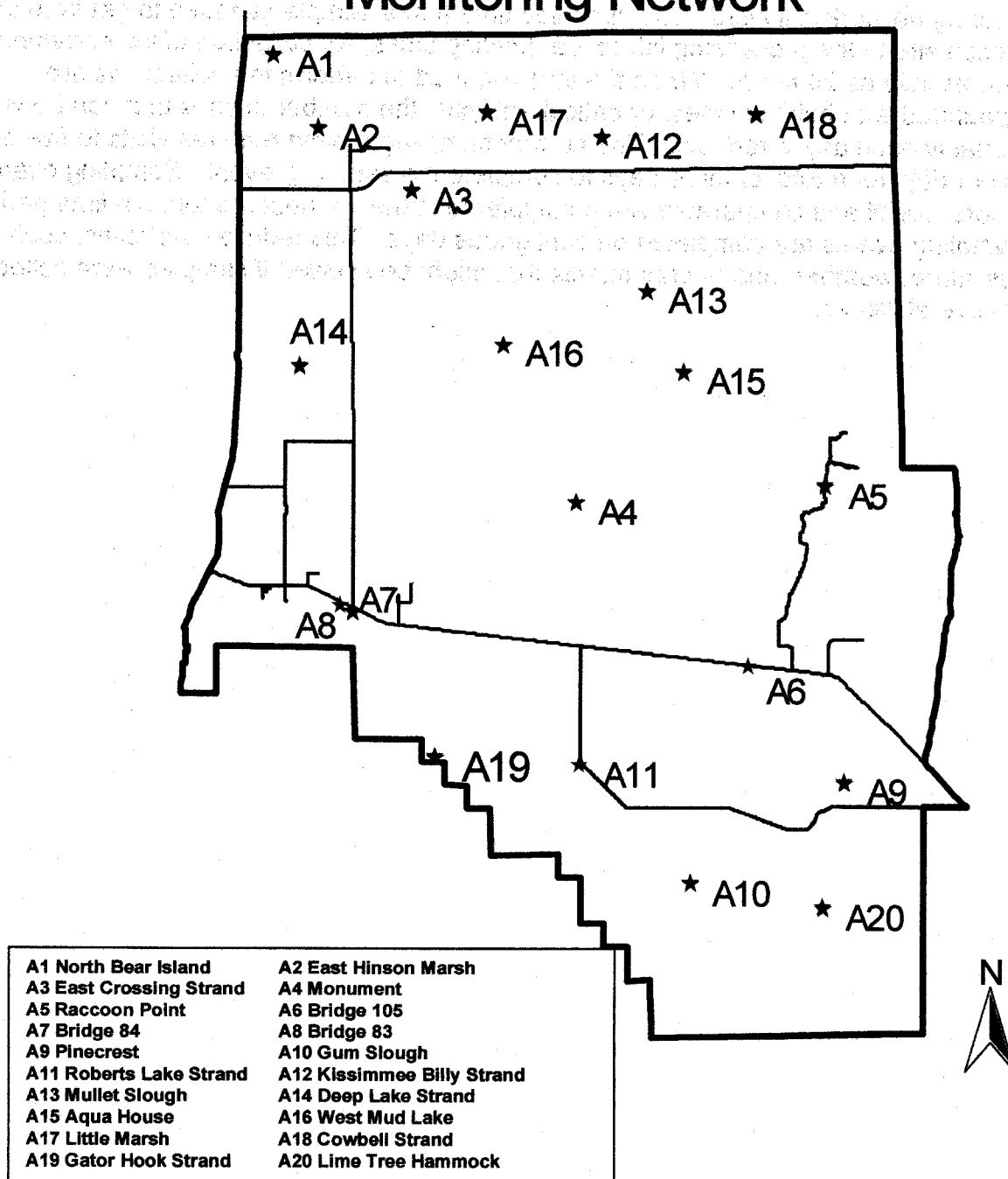
The vast majority of the Preserve is a seasonally flooded wetland, and during the wet season months (May – November), many landing sites are inundated. If the water is too high (from two to two and a half feet in depth) the helicopter cannot land safely, and alternative landing sites must be found nearby. If higher ground is not found, landing is aborted completely. The result is that some sites cannot be monitored or sampled during high water seasons. During most months of the year, the areas surrounding the monitoring stations and landing sites are under 6 inches to 2 feet of water. Once on the ground, hydrology staff carry equipment and supplies to and from the monitoring station to download data, collect water samples, and perform routine maintenance on the site. The walk from the landing site to the station varies from station to station, some are only 5 to 10 yards, but most are from 25 to 500 yards from the landing site. Sampling logistics and accuracy of sampling method are both affected at the higher water sites. At the sites where access is more difficult, carrying, collecting and preparation of samples as well as maintenance of the stations is hampered. The possibility of encounters with wildlife including snakes and alligators increases at these stations as well.

Since the monitoring program has existed, hydrology staff have noticed increases in effects on soil, including both displacement of soils and creation of deeper foot trails leading to and around the station itself. Using trails during seasons when the trails are completely submerged as well as when trails are drying down and muddy seem to have the greatest impact on the soil in the trails. At locations where the soil is shallower, the soil is displaced completely, exposing solution holes and caprock, which further complicates the site visits. When these limestone features are obscured by mud or standing water, they become a tripping hazard to staff and volunteers. Plant community changes have also been observed where trails from landing zones to monitoring sites have been in place for several years. These trails, a direct result of the monthly visits of hydrology staff, are

experiencing vegetation change to emergent aquatic species, degradation in cover and health, and in older trails – complete loss of vegetative cover.

Due to the increased time that it takes to walk between some existing and new landing zones and the sites – up to 30 minutes at several stations, the ability to expand the monitoring network is limited. The specified time that a sample can take to get from the collection site to the processing lab (a.k.a. holding times) for collection of water samples can be as little as 24 hours. When the time required to perform the collections are compounded with holding times for critical analysis, the number of sites that can be visited reasonably each day is reduced. The current sampling regime requires visits to five or six sites per day, for a total of three days to complete the sampling event. Sampling events are more useful and comparable when completed in the shortest reasonable time period, so sampling events are completed on contiguous days. This reduces variables, such as temperature, weather, and diurnal effects that might be skewed if samples were collected over several weeks.

Figure 1. Big Cypress National Preserve Hydrologic and Water Quality Monitoring Network



Stations are accessed by helicopter at all sites, except A6, A7, A8, and A11.

**Table 1. Big Cypress National Preserve Water Quality Monitoring Station/Parameter/
Frequency Matrix**

Station	Description	Field Parameters *	Core Lab Parameters **	Trace Metals ***	Pesticides Herbicides ****	Oil/Grease BTEX *****	VOC's & Semi- Volatiles *****
		Monthly	Bimonthly	Bimonthly	Semiannually	Bimonthly	Annually
BCNPA1	North Bear Island	X	X	X			
BCNPA2	East Hinson Marsh	X	X	X	X		
BCNPA3	East Crossing Strand	X	X	X			
BCNPA4	Monument Road	X	X	X			
BCNPA5	Raccoon Point	X	X	X		X	X
BCNPA6	Bridge 105	X	X	X			
BCNPA7	Bridge 84	X	X	X			
BCNPA8	Bridge 83	X	X	X			
BCNPA9	Pinecrest	X	X	X			
BCNPA10	Gum Slough	X	X	X			
BCNPA11	Roberts Lake Strand	X	X	X			
BCNPA12	Kissimmee Billy Strand	X	X	X	X		
BCNPA13	Mullet Slough	X	X	X			
BCNPA14	Deep Lake Strand	X	X	X			
BCNPA15	Aqua House	X	X	X		X	X
BCNPA16	Mud Lake West	X	X	X		X	X
BCNPA17	Little Marsh	X	X	X	X	X	X
BCNPA18	Cow Bell Strand	X	X	X	X	X	X
BCNPA19	Gator Hook Strand						
BCNPA20	Lime Tree Hammock						
pH		Ammonium		Nitrate	Silica	TDS	
Temperature		Calcium		Nitrite	Sodium	Turbidity	
Specific Conductance		Chloride		Orthophosphorus	Sulfate		
Dissolved Oxygen		Hardness		Total Phosphorus	TKN		
		Magnesium		Potassium	Alkalinity		
		Pesticides/Herbicides (4 suites)					
Arsenic, Lead, Cadmium, Copper & Zinc		Chlorinated herbicides					
		Organochlorine pesticides					
Oil and Grease		Urea herbicides and imidacloprid					
BTEX		Organonitrogen and phosphorus pesticides					

LEGISLATIVE MANDATES AND SPECIAL COMMITMENTS

This action has been developed consistent with NPS legal mandates, NPS management policies, the Big Cypress National Preserve general management plan, Water Resources Management Plan, and other approved Preserve planning documents. A review of these mandates and commitments as they relate to the proposed action is provided in this section.

Legislative mandates and special commitments include those measures that apply to the entire National Park Service, plus Preserve-specific requirements. In addition, actions in Big Cypress National Preserve must comply with all federal statutes, executive orders, and NPS policies.

The intent of all of the mandates and commitments is to establish sustainable conservation and to avoid impairment of NPS lands. As a result, actions can occur only to the extent that they do not significantly adversely affect the Preserve and its natural and cultural resources.

Applicable mandates and commitments are described below.

FEDERAL LEGISLATION AND EXECUTIVE ORDERS

National Park Service Organic Act

The National Park Service and its mandates are authorized under the NPS Organic Act (16 USC 1, 2-4) and the General Authorities Act (16 USC 1a-8). These acts direct the agency to conserve the scenery, the natural and historic objects, and the wildlife, and to provide for the enjoyment of those resources in such a manner as to leave them unimpaired for future generations. Amending the NPS Organic Act of 1916, the Redwood Act (March 27, 1978, 16 USC 1a-1) was passed shortly after Big Cypress National Preserve was established, with complete knowledge of how the Act would affect such units as Big Cypress. In this act, Congress reaffirmed the mandates of the Organic Act and provided additional guidance on National Park system management. The Redwood Act intended to serve as the basis for any judicial resolution of competing private and public values and interests in the national park system. If a conflict occurs between visitor use and protection of resources, this Act confirms the intent of Congress to favor resource protection.

Public Law 93-440, Establishment of Big Cypress National Preserve

Public Law 93-440 established the Big Cypress National Preserve in 1974 for the purpose of ensuring, "...the preservation, conservation and protection of the natural, scenic, hydrologic, floral and faunal, and recreational values of the Big Cypress Watershed in the State of Florida and to provide for the enhancement of public enjoyment thereof..."

Although Everglades National Park was not specifically mentioned, a review of House and Senate Reports (Senate Report 93-1128 and House Report 93-1/4502) identifies the water flow from the Preserve as essential to the survival of its neighbor and the south Florida

ecosystem. The following activities are to be regulated in the Preserve by the National Park Service in accordance with Public Law 93-440.

- Motorized vehicles (off-road vehicle use)
- Exploration and extraction of oil, gas, and other minerals
- Grazing
- Draining or construction of works which alter natural water courses
- Agriculture
- Hunting, fishing, and trapping
- New Construction
- Traditional land use by the Miccosukee & Seminole Tribes

Public Law 100-301, Big Cypress National Preserve Addition Act

Public Law 100-301 expanded the Big Cypress National Preserve's boundary in 1988 to include 147,280 acres (the Additions) of adjacent lands. The primary purposes of this Addition Act, as defined in Section 2 of Public Law 100-1/4301 were:

- To limit development pressure on lands bordering the Preserve.
- To enhance the protection of Everglades National Park while providing recreational opportunities and other public uses, as appropriate.

The Addition Act reinforces the intent of Public Law 93-440, in that the Preserve was established to protect a fragile water-dominated environment, which is a significant component of the Everglades ecosystem.

National Environmental Policy Act

Congress passed the National Environmental Policy Act (NEPA) in 1969. NEPA established a general Federal policy for the responsibility of each generation as trustee of the environment for the succeeding generations. Specifically, NEPA requires Federal government agencies to evaluate major actions that may significantly affect the quality of human life. An environmental assessment (EA) may be prepared to ensure evaluation of the impacts of proposed projects and facilitate public review in order to determine if the preparation of an EIS is required. Regulations implementing NEPA require the cooperation of Federal agencies in the NEPA process. The regulations also encourage the reduction of duplication through cooperation with state and local agencies including early efforts of joint planning. Specific actions may, or may not, be implemented depending on the availability of funding and staff. Compliance with NEPA will be undertaken for all actions, where appropriate, when it becomes apparent the individual actions, or groups of actions, are likely to be initiated.

Protection of Wetlands (Executive Order 11990)

This executive order requires all Federal agencies to "...minimize the destruction, loss or degradation of wetlands, and preserve and enhance the natural and beneficial values of wetlands...(Goldfarb, 1988). Federal agencies must avoid activities in wetlands that have the potential for adversely affecting the integrity of the ecosystem, unless no practical alternatives exist. National Park Service guidance for compliance with Executive Order

11990 is found in Floodplain Management and Wetland Protection Guidelines, published in the Federal Register 45FR 35916, Section 9.

Federal Water Pollution Control Act (Clean Water Act)

The Federal Water Pollution Control Act, more commonly known as the Clean Water Act, was first promulgated in 1972 and amended in 1977, 1987, and 1990. This law was designed to restore and maintain the integrity of the nation's waters. Goals set by the Act were swimmable and fishable waters by 1983 and no further discharge of pollutants into the nation's waterways by 1985. As part of the Act, Congress recognized the primary role of the states in managing and regulating the nation's water quality within the general framework developed by Congress. All Federal agencies must comply with the requirements of state law for water quality management, regardless of other jurisdictional status or land ownership. States implement the protection of water quality under the authority granted by the Clean Water Act through best management practices and through water quality standards. These practices include but are not limited to structural and non-structural controls and operations and maintenance procedures. They can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters. Water quality standards are composed of the designated use or uses made of a water body or segment, water quality criteria necessary to protect those uses, and an anti-degradation provision which may protect the existing water quality. Section 404 of the Clean Water Act requires that a permit be issued for discharge of dredged or fill materials in waters of the United States including wetlands. The U.S. Army Corps of Engineers administers the Section 404 permit program with oversight veto powers held by the U.S. Environmental Protection Agency. Under the antidegradation policy, the state must also insure that the approval of any permit will not eliminate or otherwise impair any designated uses of the receiving waters.

Endangered Species Act (1973)

The Endangered Species Act requires the National Park Service to identify and promote the conservation of all Federally-listed endangered, threatened, or candidate species within park or preserve boundaries (16 USC 1535 Section 7 (a)(1)). While not required by legislation, it is a National Park Service policy to also identify state and locally-listed species of concern, and support the preservation and restoration of those species and their habitats. The National Park Service interprets Section 7 (a)(1) as an affirmative restoration mandate and will comply through positive habitat protection and restoration programs that are integral to the proposed action.

STATE OF FLORIDA STATUTES

The State of Florida has several established programs to help protect resource values both within and outside the Preserve boundaries.

Outstanding Florida Waters (62-302.700 F.A.C.)

As part of the implementation of the Clean Water Act (40CFR 131.12), this statute grants the Department of Environmental Protection the power to establish rules which provide a category of protection to certain special water bodies, which are intended to prevent any

degradation from existing conditions. The two non-degradation categories established under this authority are Outstanding Florida Waters, and the more stringent, Outstanding National Resource Waters. The waters of Big Cypress National Preserve are classified as Outstanding Florida Waters (62-302.700 (2)(g) F.A.C.). Designated waters are to be preserved in a non-degraded state and protected in perpetuity for the benefit of the public. Under the Outstanding Florida Waters designation, industrial, commercial and residential waste water discharges (treated or untreated), and dredge & fill operations are prohibited except where clearly in the public interest. Stormwater discharge is permitted only if it has been treated according to strict state standards. Permitting under the Outstanding National Resource Waters designation is more restrictive in that it assumes that the public interest is best served by not permitting any degradation, except in the most extenuating circumstances, and even then, variances, exemptions and changes in classification, can only be granted through legislative action. Because it is so restrictive, an Outstanding National Resource Waters designation can only be granted by the state legislature. In contrast, an Outstanding Florida Waters designation can be granted or modified administratively by the Florida Department of Environmental Protection.

Coastal Management Act

This 1978 Act provided for Florida's participation in the Federal/state partnerships to ensure the wise use and protection of coastal resources authorized under the U.S. National Coastal Zone Management Act of 1972. The state receives Federal funding assistance to implement approved programs and is granted review authority over Federal activities for consistency with the state programs.

WATER RESOURCES MANAGEMENT OBJECTIVES

The legislative mandate for the Big Cypress National Preserve, as established in Public Law 93-440, states that the purpose of the Preserve is to "assure the preservation, conservation, and protection of the natural, scenic, hydrologic, floral and faunal, and recreational values of the Big Cypress Watershed.... and to provide for the enhancement and public enjoyment thereof....".

Meeting the purpose for establishing the Preserve includes the following: (1) management of the natural resources and permitted activities within Big Cypress National Preserve and (2) involvement in the overall coordinated water resource management of south Florida. Meeting this two-fold challenge will require the identification, preservation, and/or restoration of the natural hydrologic function of Big Cypress National Preserve and its watershed while also supporting and protecting the natural ecosystems of Everglades National Park, and other adjacent environments.

Objectives to meet this challenge are both specific and varied, and are based on current needs and issues facing the Preserve. These objectives are as follows:

Cooperative Management

1. Maximize the use of cooperative relationships with Everglades National Park, South Florida Water Management District, U.S. Army Corps of Engineers, U.S. Geological

Survey, Miccosukee and Seminole Tribes, local governments, and other entities, to achieve the purposes of the Preserve. In addition, utilize these relationships to contribute substantively to ecosystem restoration efforts and regional water management objectives.

2. Protect both the quantity and quality of waters contributed by the Preserve's watershed to Everglades National Park, Water Conservation 3A, and Fakahatchee Strand State Preserve.

Preserve Operations

1. Assure that developments and operations of the Preserve do not adversely affect the resources and water-dependent environments of the Preserve.
2. Manage uses permitted in the enabling legislation so that adverse impacts to water quality and flow are either minimized or eliminated.
3. Promote water conservation through both National Park Service actions, and cooperation with local communities, and state and Federal agencies.
4. Promote public awareness and understanding of the importance and function of these significant water resources and their dependent environments.

Inventory and Monitoring

1. Monitor aspects of the hydrologic system in order to understand its condition and function, so that these data can be integrated into regional data management systems and regional models.
2. Gather and analyze information on quantity and quality of the water resources necessary for the understanding of both historic and present hydrologic conditions.
3. Provide for the continual appraisal of current water conditions, assessment of trends, and detection of anomalous changes, support technical studies and provide a necessary basis for informed management decisions.

Water Quality and Quantity

1. Maintain, or where needed, restore the naturally-high water quality and historic flows
2. Seek the highest level of protection under Federal and state water quality regulations appropriate for the Preserve.

Wetland Ecosystems

1. Recognize the significance of the diversity and function of wetlands, and preserve and/or restore their function, extent, and habitat heterogeneity.
2. Promote water management practices that discourage the invasion of exotic species
3. Mitigate the impacts of man-made structures and other physical modifications that cause adverse changes in the hydrologic regime of the Preserve.

Oil and Gas

Ensure that permitted oil and gas exploration and development are accomplished with minimal impact on both surface and groundwater resources.

Inundation

Minimize damage from inundation by adapting Preserve facilities and operations to known fluctuations in water levels.

Fire Management

Coordinate water resources management and fire management through more efficient information transfer to achieve more natural fire and water regimes.

ISSUES AND IMPACT TOPICS EVALUATED

Issues are potential environmental problems that may result from the federal action, if it is taken. Preserve staff identified issues. Once issues were identified, they were used to help formulate the alternatives and mitigation measures. Impact topics were then selected for detailed analysis based on substantive issues: environmental statutes, regulations, and executive orders; and NPS Management Policies (1988). A summary of specific impact topics and rationale for their selection is given below.

Natural Resource Impact Topics

Soil and Water Quality

Any of the proactive proposed actions would expose soil and water to various contaminants. NPS Management Policies require the protection of water quality consistent with the Clean Water Act and an examination of impacts during planning.

Wetlands, Hydrology, and Vegetation

The activities would occur in and near wet areas. Special consideration of impacts on wetlands is required by Executive Order (EO) 11990 ("Protection of Wetlands") and the Clean Water Act.

Upland Vegetation

Alternative D may result in the creation of unnatural upland soil mounds where establishing native plant communities would be very difficult. Alternatives B, C, D, and the No Action Alternative may alter or degrade existing upland vegetation. NPS policy is to maintain all the components and processes of naturally evolving ecosystems, including the natural abundance, diversity, and ecological integrity of plants and animals (NPS 1988).

Fish and Wildlife

The No Action Alternative, Alternative B, C, and D could create unnatural wildlife habitat conditions, or affect current habitat. Construction activities may temporarily disturb wildlife, and temporarily degrade habitat but improve native fish and wildlife conditions over the long term.

Special Status Species (Threatened, Endangered, and Rare Species)

The Endangered Species Act requires an examination of impacts on all federally endangered, threatened, or candidate species. NPS policy also requires examination of the impacts on state-listed species. Such species are listed in Table 2, and addressed in the Affected Environment section. In addition, consultation will be conducted on this EA with US Fish and Wildlife Service, in accordance with Section 7 of the Endangered Species Act.

Socioeconomic Environment and Visitor Experience Impact Topics

NPS Management Policies require an examination of socioeconomic and visitor experience impacts when planning for new projects.

Local and Regional Economy

Contracting and construction related employment and expenditures would temporarily benefit the local economy.

Preserve Operations

Several of the alternatives would require additional staff or re-commitment of staff time and funds to manage activities and ensure safety of staff and visitors.

Visitor Experience

Improved landing areas in remote locations may negatively affect park visitors and their experience in the Preserve. Alternatives B, C, D, the No Action Alternative and the Preferred Alternative would leave unnatural features on the landscape that would be visible to visitors who may be travelling on two designated ORV trails. Landing at structures or altered, improved sites would lead to less time on the scene, which may positively affect visitor experience.

Cumulative Impacts

The Council on Environmental Quality defines a cumulative impact as follows: *The impact on the environment which results from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes the action. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time (CFR 1508.7).* Several of the alternatives would result in Cumulative Impacts on the Preserve and its resources, and are addressed individually in the Environmental Consequences Section.

TOPICS DISMISSED FROM DETAILED ANALYSIS

Several topics were eliminated from further analysis because they were considered to be outside the scope of this environmental assessment, the best available information indicated that impacts would be negligible, nor did they indicate public or regulatory concerns in association the actions evaluated. The topics considered but not evaluated further in the "Environmental Consequences" section of this document include the following:

Designated Wilderness

At this time, there are no designated wilderness areas in the Preserve. Therefore, this topic was not considered in detail in this evaluation.

Other Wildlife Species

Other federally protected species, such as the eastern indigo snake, were considered but dismissed from detailed analysis. These species typically are not found in the affected areas and/or their preferred habitat would not be physically disturbed under either

alternative. Therefore, specific measures to protect these species are not needed, other than general protection afforded by the national Preserve (NPS 1991).

The American alligator is federally listed because of the similarity of its appearance to the endangered American crocodile. Because the crocodile does not occur in the Preserve, effects to the alligator were not considered.

Preserve Use by Miccosukee and Seminole Tribes

The Preserve's enabling legislation provides for the usual and customary use and occupancy of the Preserve by the Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida. Nothing in the alternatives considered would interfere with these tribes' abilities to exercise their rights. Therefore, this topic was not considered in detail in this evaluation.

Air Quality

Big Cypress National Preserve has been designated a Class II area under the Clean Air Act. The Preserve is currently within a designated attainment area (i.e., concentrations below standards) for criteria pollutants. Proposed actions would not affect current conditions, therefore this topic was dismissed from detailed analysis.

Mineral Interests

The proposed action would not affect mineral exploration or extraction operations in the Preserve. Mineral operations are beyond the scope of this action. The Big Cypress National Preserve Mineral Management Plan, which is an appendix to the General Management Plan (NPS 1991), provides details on management of mineral-related activities. Thus, mineral interests were dismissed from detailed analysis.

Floodplains

The Executive Order (11988) for floodplain management directs federal agencies to reduce the risk of flood loss; to minimize the impact of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains. NPS Floodplain Management Guidelines (NPS 1993b) provide procedures for carrying out this order. Although landing areas are located in seasonally flooded areas, this would not create any special hazards and thus would be an excepted action under the guidelines. Therefore, impacts on floodplains were dismissed from further analysis.

Cultural Resources

Cultural resources were dismissed from further detailed analysis. Nonstructural and other significant cultural resources will continue to be protected through management zoning and monitoring. Measures to protect sites on or eligible for the National Register of Historic Places as described in the general management plan and final environmental impact statement (NPS 1991) would be carried out to ensure that these sites were protected from impact.

Environmental Justice

E.O. 12898 requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects on minorities and low-income populations and communities. The

proposed action is not expected to result in significant changes in the socioeconomic environment of the affected area, and therefore would not impact minorities or low-income

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Prime and Unique Agricultural Lands

The Farmland Protection Policy Act (7 USC 4201 *et seq.*) and the U.S. Department of the Interior (Environmental Statement Memorandum No. ESM 94-7 – Prime and Unique Agricultural Lands) require an evaluation of impacts on prime or unique agricultural lands. No prime or unique agricultural lands exist in the Preserve. Therefore, this topic was dismissed from further consideration.

Transportation

None of the alternatives evaluated in the EA would considerably affect roads, or normal traffic patterns for Preserve staff or visitors. Therefore, this topic was dismissed from further consideration.

Land Use

The proposed action would take place on federally owned land. None of the activities would take place on, nor would they significantly affect private landowners in the Preserve. Therefore, this topic was dismissed from further analysis.

II. The Alternatives

The Alternative section describes a range of reasonable alternatives that help illustrate the solutions for executing the expansion of the hydrologic and water quality monitoring programs at Big Cypress National Preserve while preserving the resources that are to be monitored.

Six action alternatives were evaluated. Under Alternative A, existing helicopter operations at Big Cypress National Preserve would be modified through the installation and removal of floats onto the skids of the helicopter during high water sampling events. Under Alternative B, an additional helicopter with floats would be contracted during each sampling event to support the hydrology monitoring program. Under Alternative C, landing sites would be developed as near to monitoring stations as possible, and new landing sites would be developed as the current sites deteriorated. Under Alternative D, temporary parking pads of mounded earth or imported fill would be used to provide safe landing conditions during high water. Under Alternative E, engineer-designed, aluminum landing/parking pads would be installed at monitoring stations to provide safe landing conditions during high water, while minimizing impacts to the surrounding hydrology and vegetation.

In addition, NEPA regulations require that a no-action alternative be evaluated to provide a baseline. Under the no action alternative, the current monitoring scheme and helicopter landing protocol would be employed.

Each alternative was analyzed to determine its suitability for the National Park Service, and its impact on the resources in the Preserve. Following is a brief description of the alternatives and a summary of the environmental consequences for each.

No Action Alternative

Under this Alternative, the current monitoring scheme and helicopter landing protocol would be employed. Landing sites would remain as and where they are, and no improvements would be made to landing zones, except for periodic removal of vegetation.

The consequences to the environment would be continued degradation of soil and vegetation in trails and at the landing zones. Trails would still be worn from wet landing sites to monitoring stations, and at times, some sites would not be accessed due to high water resulting in lost data.

Alternative A: Modifications of existing Helicopter Operations – Installation of Floats for sampling during high water

Big Cypress National Preserve would modify current helicopter operations by providing for the use of floats on the helicopter. The floats would be installed and uninstalled after each hydrology monitoring flight by the contractor's certified mechanic, so that the helicopter would still be available for fire and law enforcement activities. No modifications to the landing sites or monitoring stations would be performed.

The consequences to the environment would be continued degradation of soil and vegetation in trails and at the landing zones. Trails would still be worn from wet landing sites to monitoring stations.

Alternative B: Contracting additional Helicopter support – Contract helicopter with Floats for sampling during high water

Big Cypress National Preserve would modify current helicopter operations by providing for the use of floats on the helicopter. The Preserve would amend its aviation contract by adding an onsite helicopter with attached floats for hydrology work, in addition to the one helicopter without floats still available for fire and law enforcement activities. No modifications to the landing sites or monitoring stations would be performed.

The consequences to the environment would be continued degradation of soil and vegetation in trails and at the landing zones. Trails would still be worn from wet landing sites to monitoring stations.

Alternative C: Using Alternative Landing - Offsite landing / walk

Big Cypress National Preserve would site and improve new landing sites at higher elevations where possible or practicable so that landing during high water would be possible during more months of the wet season. Not all sites could be accommodated under this alternative.

The consequences to the environment would be continued degradation of soil and vegetation in trails and at the landing zones. Less suitable or unusable sites would be abandoned, and rehabilitated where necessary, and new landing sites would be cleared of vegetation that would inhibit helicopter landing. New trails would be worn between landing sites and monitoring stations, which would be less apparent in upland habitats, but in wetter areas, degradation of surrounding landscape conditions would continue.

Alternative D: Mounded Earth landing sites

The Preserve would import sterile fill to create landing pads in wet sites, to increase safety while landing during high water. The mounds would be approximately 15 feet by 15 feet and 3 feet in elevation. Maintenance would be necessary to keep the landing site free of vegetation for landing, and periodic inspection for integrity of soil mound to ensure safe landing of the helicopter would be required. Boardwalks could be built from the landing pad to monitoring site to minimize soil impacts.

The consequences to the environment would be continued degradation of soil and vegetation in trails and at the landing zones. Where walkways between landing sites would not be built, trails would continue to degrade soils and vegetation. Importing fill would impede sheetflow locally, and raised earth would invite invasive plant establishment. Installing boardwalks can result in elevated arsenic and other chemicals, which may give false water quality results and release these chemicals into the environment.

Alternative E: Engineer - designed parking pads (Preferred Alternative)

The Preserve would use engineer-designed drawings and plans to build helicopter landing pads, which would be anchored to caprock with (16" diameter) reinforced concrete pilings. The porous aluminum decking would be supported approximately 36" above ground surface on four aluminum legs. To meet OAS requirements, the pads would be approximately 25 feet from monitoring stations, and boardwalk would be installed between landing pad and monitoring station, to reduce soil impact and increase staff safety.

The consequences to the environment would be lessened because the raised platforms would reduce the impact from foot traffic to soils and vegetation. After initial construction, the pads and walkways would not impede sheetflow, nor would they inhibit vegetation recruitment or vigor. Alternative E would lessen the opportunity for exotics invasion, since there would be no raised soil elevation.

III. Affected Environment

Natural Resources

This section describes the characteristics of the existing natural environment that could be affected by all alternatives. The description of the affected environment focuses on only those environmental aspects potentially subject to effects from the alternatives. As discussed in "Purpose of and Need for the Plan," the National Park Service has identified impact topics that may be affected by the proposed action or the no action alternative (continue current management). The Affected Environment section establishes the basis for the analysis of alternatives as well as the environmental consequences, which

assesses the effects the alternatives may have on the impact topics within the affected environment.

The actions evaluated will occur in specific locations in the Preserve. They will typically occur in the wetter areas of the Preserve, where hydrologic monitoring stations would be located. Since dryer areas of the Preserve are not the locations normally chosen to install hydrologic monitoring stations, the impacts to these areas would be minimal. As such, they will be mentioned only cursorily in the alternative evaluation, and will not be discussed in detail here.

Surface Water Flows

The Preserve is exceptionally flat, with a typical gradient of only 5 to 10 inches per mile. Surface water hydrology of Big Cypress National Preserve is typically characterized as a "sheetflow" flooding regime. During the wet season, the landscape becomes covered with a shallow, continuous expanse of water that flows slowly toward the coast. Water movement is almost imperceptible in the interior of the Preserve, where the terrain slopes an average of less than a foot per mile. However, flows are easily observable where the expanse of sheetflow is constricted to pass under a roadway or is channeled into a canal.

Surface water flows across the entire area during high-water conditions. It is most pronounced and is retained the longest in the forested cypress strands and marshy sloughs, where hydrostations are most often located; as opposed to shorter hydroperiod prairies or pinelands.

Wet-season conditions typically prevail from early summer to early winter. The quantity of water varies depending on the amount of summer rains, frequency of tropical depressions, occurrence of winter rain, and upstream water management practices. Typically, marsh, prairie, and cypress areas will have water depths of 1 to 3 feet, while areas of pines and hammock habitats will experience little or no inundation.

Water Quality

The original boundary of the Preserve was established at the perimeter of a predominantly self-contained, rain-driven watershed that lies upgradient of Everglades National Park. Major cypress strands were logged in the early 1900s and areas of the watershed were used as farmland in the decades prior to the Preserve's establishment. However, the area's remoteness limited it to only sparse development, much of which has been reclaimed since the Preserve's establishment in 1974. As a result, the quality of the water within the Preserve is high.

The waters of Big Cypress National Preserve are currently designated as Outstanding Florida Waters. This is a state designation, delegated by the U.S. Environmental Protection Agency (EPA) under the Clean Water Act, and is intended to protect existing, high-quality waters.

The low nutrient, high-quality water in the Preserve is vulnerable to degradation from contaminants. Because the water is of such high quality, even small amounts of contaminants can result in relatively large adverse effects. External sources of pollution primarily include nutrient-enriched runoff from upstream agricultural activities, especially

along the northern boundary of the Preserve. Internal contaminant sources include leakage and ancillary activities associated with oil and gas exploration and development, operation of vehicles along roads in the Preserve, and oil and gas leakage and soil disturbance caused by the operation of ORVs in the Preserve.

The intent of the water monitoring program is to provide a long-term record for assessing ambient water quality conditions and contamination threats. In some cases, subtle modification to water quality can impact other biological, vegetative, and wildlife components of the environment, and the existence of many localized impacts can translate into regional-scale and long-term impacts if the processes that cause them occur regularly and are permanent.

Soils

According to Duever *et al.* (1986a), most of the soils at Big Cypress National Preserve are simple geological and biological products that have not had sufficient time or environmental conditions for evolution into true soils. Marl, sand, organic matter, and rock are the four substrate types in the Preserve.

Carbonate marls are the most widespread unconsolidated soil type of the Preserve. Marls are mixtures of calcareous clays with calcite particles, sand, and/or shell fragments, and may have periphyton precipitates at the surface. Marl soils support few trees and provide poor traction when wet. A hard limestone substrate, commonly called cap rock, is typically located 10 inches to 40 inches below the soil surface. The limestone also outcrops at the land surface, particularly within hardwood hammocks. The shallow limestone rock is typically pitted with solution holes of all sizes. Cypress domes indicate areas of thicker soil deposition. Typically, advanced dissolution and subsequent collapse of the limestone rock cause these domes as part of the natural weathering process.

Sand deposits within the Preserve are thin, infrequent, and likely derived from old shoreline deposits. Peats derived from partially decayed plant material are also present in the Preserve and are identified by their major plant components that include mangroves and sawgrass. The calcium carbonate-rich organic soils that occur throughout most of the Preserve (less so in the north) are extremely pliable when saturated and are susceptible to deformation. Localized impacts include complete loss of the soil (bedrock exposure), rutting and ridging of soil, and water channelization.

Duever *et al.* (1986b), in a study of old trails in Big Cypress National Preserve, stated that once soils have been displaced, there are few natural mechanisms of restoring ground contour, and damage remains indefinitely. Therefore, it is likely that soil impacts are cumulative and worsen over time.

Vegetation

The Big Cypress National Preserve General Management Plan and Environmental Impact Statement (NPS 1991) included a comprehensive description of the vegetation resources. Since then, vegetation has been re-classified by Welch *et al.* (1999) to provide consistency with the mapping of other public lands in the south Florida region. The largest changes were that some areas formerly classified as marsh, such as those in the Stairsteps Unit, are now defined as prairie. The ecological importance of the vegetation communities in the

Preserve has changed little since the publication of the general management plan. Eleven major vegetation types occur in the Preserve. Hydrology monitoring stations are generally placed in locations where monitoring can occur in both dry and wet conditions. Six of the eleven vegetation types would meet these criteria. The vegetation types that would be appropriate for hydrology monitoring stations are:

Marshes

Marshes in Big Cypress National Preserve include fresh water and salt water wetlands. They consist of open communities with few trees or shrubs and a ground cover that is dominated by emergent herbs. Inundation is year-round or nearly year-round.

Cypress Strands and Domes, Mixed Hardwood Swamps, and Sloughs

Cypress strands, mixed hardwood swamps, and sloughs form irregular bands trending northeast to southwest along the major drainages of the Preserve. These communities, along with the scattered cypress domes, are the wettest of all vegetation types in the Preserve. The interiors of these types are important refuges and concentration points for water-dependent wildlife during the annual dry season. The general management plan contains more detailed descriptions of each of these vegetation types (NPS 1991). Because these wetlands depend on topographic depressions, water depth increases substantially from their edges to the center.

Sloughs, which are located primarily in the marshes of the Stairsteps Unit, typically contain deep water, deposits of muck or peat, and thickets of willow.

Mangroves

The mangrove communities in Big Cypress National Preserve are found primarily in Zone 1 of the Stairsteps Unit (See Figure 1). Zone 2 of the Stairsteps Unit contains mangrove forest along its southern edge. One hydrology monitoring station is located in Zone 2.

Wildlife

The General Management Plan and Environmental Impact Statement (NPS 1991) included a comprehensive description of the wildlife resources of the Preserve. Ten species of wildlife that are federally listed as either endangered or threatened reside in Big Cypress National Preserve. The state of Florida lists an additional seven species that occur in the Preserve as threatened or endangered. Of these 17 species, two are reptiles, nine are birds, and six are mammals.

The state lists an additional 13 species of special concern (SSC). These species warrant attention because they have experienced long-term population declines and are vulnerable to exploitation or environmental changes. Table 8 displays the status of all 30 special status wildlife species that occur in Big Cypress National Preserve.

The diverse habitats of the Preserve support numerous species that are not federally listed as endangered or threatened, yet are important components of a healthy and balanced ecosystem. Duever *et al.* (1986a) provided a partial list of birds, reptiles, amphibians, and mammals that use the habitats of the Preserve. A list of the fish and invertebrates has not been compiled.

Table 2: Listed Wildlife Species in Big Cypress National Preserve ^{a/}

Common Name	Type	Scientific Name	Designated Status ^{b/}	
			Federal	State
Florida tree snail	Mollusk	<i>Liguus fasciatus</i>		SSC
Common snook	Fish	<i>Centropomus undecimalis</i>		SSC
American alligator	Reptile	<i>Alligator mississippiensis</i>	T (S/A)	SSC
Eastern indigo snake	Reptile	<i>Drymarchon corais couperi</i>	T	T
Roseate spoonbill	Bird	<i>Ajaia ajaja</i>		SSC
Cape Sable seaside sparrow	Bird	<i>Ammodramus maritimus mirabilis</i>	E	E
Limpkin	Bird	<i>Aramus guarauna</i>		SSC
White-crowned pigeon	Bird	<i>Columba leucocephala</i>		T
Little blue heron	Bird	<i>Egretta caerulea</i>		SSC
Reddish egret	Bird	<i>Egretta rufescens</i>		SSC
Snowy egret	Bird	<i>Egretta thula</i>		SSC
Tri-colored heron	Bird	<i>Egretta tricolor</i>		SSC
White ibis	Bird	<i>Eudocimus albus</i>		SSC
Arctic peregrine falcon	Bird	<i>Falco peregrinus tundrius</i>		E
Florida sandhill crane	Bird	<i>Grus canadensis pratensis</i>		T
American oystercatcher	Bird	<i>Haematopus palliatus</i>		SSC
Bald eagle	Bird	<i>Haliaeetus leucocephalus</i>	T	T
Wood stork	Bird	<i>Mycteria americana</i>	E	E
Osprey	Bird	<i>Pandion haliaetus</i>		SSC
Brown pelican	Bird	<i>Pelecanus occidentalis</i>		SSC
Red-cockaded woodpecker	Bird	<i>Picoides borealis</i>	E	T
Everglade snail kite	Bird	<i>Rostrhamus sociabilis</i>	E	E
Black skimmer	Bird	<i>Rynchops niger</i>		SSC
Least tern	Bird	<i>Sterna antillarum</i>		T
Everglades mink	Mammal	<i>Mustela vison evergladensis</i>		T
Mountain lion	Mammal	<i>Puma concolor</i>	T (S/A)	
Florida panther	Mammal	<i>Puma concolor coryi</i>	E	E
Big Cypress fox squirrel	Mammal	<i>Sciurus niger avicennia</i>		T
West Indian manatee	Mammal	<i>Trichechus manatus</i>	E	E
Florida black bear	Mammal	<i>Ursus americanus floridanus</i>		T

a/ Sources: USFWS 1999a and Florida Fish and Wildlife Conservation Commission 1997.

b/ E = endangered. S/A = similarity of appearance to a threatened or endangered species.
SSC = species of special concern. T = threatened.

Cultural Resources

There are over 400 known archaeological sites within the Preserve which represent historic and pre-historic Native American activities. In addition, there are several contemporary ceremonial sites used on a routine basis by members of the Miccosukee and Seminole tribes. Cultural use of some natural resources occurs in exercising Native American subsistence rights. The Preserve is also examining other potential historical and cultural resources within the Preserve.

About 200 members of the Miccosukee and Seminole Tribes of Indians reside in the Preserve on either individual sites or in a series of 11 small villages. Two sites are set aside for Miccosukee religious ceremonies in the original Preserve boundary and one Seminole site exists in the Addition Area. While the legislation establishing the Preserve authorizes Tribal members' customary use and occupancy, it does so subject to reasonable regulations.

Visitor Experience

Big Cypress National Preserve visitors participate in a variety of motorized and non-motorized recreational activities, including camping, hunting, hiking, canoeing, wildlife observation, photography, fishing, sightseeing, bicycling, and picnicking. Camping occurs in both frontcountry and backcountry sites. Walk-in hunting particularly occurs in the Loop Unit and Deep Lake Unit. The backcountry visitors are the most likely to be impacted by the proposed action. Backcountry visitors would include private property owners, who may be affected while accessing their property.

III. Environmental Consequences

This chapter describes the potential environmental consequences of the proposed action, Alternatives A-E, and the No Action Alternative occurring in Big Cypress National Preserve. They are arranged by Alternative, and then by impact topic.

No Action Alternative – Continue Current Management Practices

Soil and Water Quality

Soil quality would continue to be negatively impacted, since staff would still need to walk to inundated stations – exacerbating localized soil impacts. Trails are created and deepened when staff use the same trail repeatedly to access stations. The helicopter cannot always get close to the stations, so staff would still use trails of up to 500 yards. As the trails get deeper, and eventually become impassible due to higher water, exposed pinnacle rock, solution holes, and deep mud, new trails will need to be created. This continual establishment of new landing sites and trails will lead to expanding degradation of surrounding landscape.

Localized turbidity and water quality problems could arise due to suspension of sediment in the water column, exposing the water to various contaminants. This is especially important since part of the monitoring program collects samples for water quality analysis.

Wetlands, Hydrology, and Vegetation

Several of the monitoring stations and their helicopter landing sites are in marshy areas and ponds, and where trails have been worn in the soil, changes in vegetation are evident. Hydrologic changes due to channelization of flow in trails are suspected to be considerable, and studies are currently proposed to quantify the breadth of the impact on Preserve hydrology. Long term changes in vegetation and impacts to delicate root systems could occur from repeated use of foot trails if the no action alternative is implemented.

Upland Vegetation

The byproduct of the no action alternative, the continued propagation of walking trails to and from stations, may degrade existing upland vegetation. Several sites are adjacent to hardwood hammocks, and in one case the trail to the station leads through a hardwood hammock in the Loop Unit of the Preserve.

Fish and Wildlife

Trails to and from stations have the potential to disrupt the natural wildlife habitat. At one station, foot access trails cross a large game trail, and the deeper trails at several of the older stations, create unnatural habitat for fish, reptiles, and amphibians by ponding water for longer periods of time than the surrounding land.

Special Status Species (Threatened, Endangered, and Rare Species)

Habitat for species of special status is present near many of the hydrology monitoring stations. The no action alternative would not have a considerable impact on any federally endangered, threatened, or candidate species, initially. The impact on state-listed species would also be negligible in the short term. Long term effects would be the continued degradation of habitat by continuing to use trails, and establishing new trails when old ones become unusable.

Local and Regional Economy

Since the no action alternative would not affect the existing method of access, there would be no benefit or detriment to the local or regional economy.

Preserve Operations

This alternative would require additional staff and funds to manage activities. During high water situations, some landings would be aborted for safety, and additional flight time and staff commitment would be necessary to complete monitoring activities. Some sample collection activities would need to be rescheduled or modified, which would increase laboratory analysis costs. Landing site maintenance activities, social trail restoration, assistance with clearing of vegetation and additional helicopter trips to complete activities would be necessary.

Visitor Experience

The no action alternative would not produce a change in visitor experience. Visible trails at monitoring stations would not be a departure from current landscape feature unless expansion of foot trails made it so.

Analysis of this alternative compared to the Proposed Action

The proposed action would inflict fewer impacts on the surrounding environment.

Cumulative Impacts

The cumulative impacts of the no action alternative are associated with the continuation of current use practices. Under continued use of the current management scheme, natural resources would be damaged with little or no lessening of impacts to soil, vegetation, and water quality.

Alternative A: Modifications of existing Helicopter Operations – Installation of Floats for sampling during high water

Soil and Water Quality

Soil quality would be negatively impacted, since staff would still need to walk to inundated stations – exacerbating localized soil impacts. Trails are created by staff to access monitoring stations, and then are deepened when staff members use the same trail repeatedly to access stations. The helicopter cannot always get close to the stations, so trails of up to 500 yards would be used and maintained by staff. As the trails get deeper, and eventually become impassible due to higher water, exposed pinnacle rock, solution holes, and deep mud, new trails will need to be created.

Localized turbidity and water quality problems could arise due to suspension of sediment in the water column. This is especially important since part of the monitoring program collects samples for water quality analysis.

Wetlands, Hydrology, and Vegetation

Several of the monitoring stations and their helicopter landing sites are in marshy areas and ponds, and where trails have been worn in the soil, changes in vegetation are evident. Hydrologic changes due to channelization of flow in trails are suspected to be considerable, and studies are currently proposed to quantify the breadth of the impact on Preserve hydrology. No changes in vegetation would result from the helicopter landing at any sites, since the floats would keep the majority of the weight suspended in the water, lessening the impact on delicate root systems from landing the helicopter but there would be no reduction of impacts from foot trails.

Upland Vegetation

The byproduct of Alternative A, the continued propagation of walking trails to and from stations, may degrade existing upland vegetation. Several sites are adjacent to hardwood hammocks, and in one case the trail to the station leads through a hardwood hammock in the Loop Unit of the Preserve.

Fish and Wildlife

Trails to and from stations have the potential to disrupt the natural wildlife habitat. At one station, foot access trails cross a large game trail, and the deeper trails at several of the older stations, create unnatural habitat for fish, reptiles, and amphibians by ponding water for longer periods of time than the surrounding land.

Special Status Species (Threatened, Endangered, and Rare Species)

Habitat for species of special status is present near many of the hydrology monitoring stations. Alternative A would not have a considerable impact on any federally endangered, threatened, or candidate species, initially. The impact on state-listed species would also be negligible in the short term. Long term effects would be the continued degradation of habitat by continuing to use trails, and establishing new trails when old ones become unusable.

Local and Regional Economy

Since Alternative A would only affect a previously existing aviation services contract, there would be no benefit or detriment to the local or regional economy.

Preserve Operations

Alternative A would require additional staff time and funds to manage activities. We are currently charged on a per-visit basis for maintenance to the helicopter. Since the floats would need to be installed and removed by the contract mechanic each day that a monitoring flight is performed, maintenance costs will increase significantly. When more staff time is devoted to the execution of these contract functions, less staff time can be committed to other regular duties.

Visitor Experience

Alternative A would not affect visitor experience considerably. Visible trails at monitoring stations would not be a departure from current landscape feature unless expansion of foot trails made it so.

Analysis of this alternative compared to the Proposed Action

The proposed action would inflict fewer impacts on the surrounding environment, because this action would continue the use of trails to and from monitoring stations. The helicopter would not be as accessible for other Preserve operations during its use for hydrology missions, as the floats would need to be installed and removed by technicians supplied by the contractor before it could be used for fire or other operations.

Analysis of this alternative compared to the No Action Alternative

While resource degradation would continue under this alternative as in the No Action alternative, the benefit would be access to the stations during all water level conditions.

Cumulative Impacts

The cumulative impacts of this alternative would result from the incremental nature of the Alternative. Over a period of time, the impacts would be continued degradation of soil, vegetation, and water quality.

Alternative B: Contracting additional Helicopter support – Contract helicopter with Floats for sampling during high water

Soil and Water Quality

As in the no action alternative and Alternative A, Alternative B would continue to negatively impact soil quality, since staff would still need to walk to inundated stations – exacerbating localized soil impacts. Trails are created by staff to access monitoring stations, and then

are deepened when staff members use the same trail repeatedly to access stations. The helicopter cannot always get close to the stations, so trails of up to 500 yards would be used and maintained by staff. As the trails get deeper, and eventually become impassible due to higher water, exposed pinnacle rock, solution holes, and deep mud, new trails will need to be created.

Localized turbidity and water quality problems could arise due to suspension of sediment in the water column. This is especially important since part of the monitoring program collects samples for water quality analysis.

Wetlands, Hydrology, and Vegetation

Several of the monitoring stations and their helicopter landing sites are in marshy areas and ponds, and where trails have been worn in the soil, changes in vegetation are evident. Hydrologic changes due to channelization of flow in trails are suspected to be considerable, and studies are currently proposed to quantify the breadth of the impact on Preserve hydrology. No changes in vegetation would result from the helicopter landing at any sites, since the floats would keep the majority of the weight suspended in the water, lessening the impact on delicate root systems from landing the helicopter but there would be no reduction of impacts from foot trails.

Upland Vegetation

The byproduct of Alternative B, the continued occurrence of walking trails to and from stations, may degrade existing upland vegetation. Several sites are adjacent to hardwood hammocks, and in one case the trail to the station leads through a hardwood hammock in the Loop Unit of the Preserve.

Fish and Wildlife

Trails to and from stations have the potential to disrupt the natural wildlife habitat. At one station, foot access trails cross a large game trail, and the deeper trails at several of the older stations, create unnatural habitat for fish, reptiles, and amphibians by ponding water for longer periods of time than the surrounding land.

Special Status Species (Threatened, Endangered, and Rare Species)

Habitat for species of special status is present near many of the hydrology monitoring stations. Alternative B would not have a considerable impact on any federally endangered, threatened, or candidate species, initially. The impact on state-listed species would also be negligible in the short term. Long term effects would be the continued degradation of habitat by continuing to use trails, and establishing new trails when old ones become unusable.

Local and Regional Economy

The current aviation services contract for helicopter is through a local company. Presuming a continuation of the current contract, the local economy may be positively affected by the increased revenue to the contractor.

Preserve Operations

Alternative B would require additional staff and funds to manage activities. The Preserve currently pays for one helicopter to be on-site for Preserve operations. Under this

alternative, two helicopters would be required to be on-site for at least one week per month, the helicopter used for hydrology monitoring flights would need to be outfitted with floats, and an additional pilot would need to be provided, since the Preserve has only one pilot on staff. The aviation costs associated with hydrology flights would increase substantially.

Visitor Experience

Alternative B would not affect visitor experience considerably. Visible trails at monitoring stations would not be a departure from current landscape feature unless expansion of foot trails made it so.

Analysis of this alternative compared to the Proposed Action

The proposed action would inflict fewer impacts on the surrounding environment, because Alternative B would continue the use of a set of trails to and from monitoring stations. The second helicopter would not be as accessible for other Preserve operations during its use for hydrology missions, as the floats would need to be installed and removed by technicians supplied by the contractor before it could be used for fire or other operations.

Analysis of this alternative compared to the No Action Alternative

While resource degradation would continue under this alternative as in the No Action alternative, the benefit would be access to the stations during all water level conditions.

Cumulative Impacts

The cumulative impacts Alternative B would result from the incremental nature of the Alternative. Over a period of time, the impacts would be continued degradation of soil, vegetation, and water quality.

Alternative C: Using Alternative Landing - Offsite landing / walk

Soil and Water Quality

Soil quality would be negatively affected under Alternative C, since staff would still need to walk to inundated stations – exacerbating localized soil impacts. Trails are created by staff to access monitoring stations, and then are deepened when staff members use the same trail repeatedly to access stations. The helicopter cannot always get close to the stations, so trails of up to 500 yards would be used and maintained by staff. As the trails get deeper, and eventually become impassible due to higher water, exposed pinnacle rock, solution holes, and deep mud, new trails will need to be created. This continual establishment of new landing sites and trails would lead to degradation of surrounding landscape.

Localized turbidity and water quality problems could arise due to suspension of sediment in the water column, exposing the water to various contaminants. This is especially important since part of the monitoring program collects samples for water quality analysis.

Wetlands, Hydrology, and Vegetation

Several of the monitoring stations and their helicopter landing sites are in marshy areas and ponds, and where trails have been worn in the soil, changes in vegetation are evident. Hydrologic changes due to channelization of flow in trails are suspected to be

considerable, and studies are currently proposed to quantify the breadth of the impact on Preserve hydrology. Some temporary, localized changes in vegetation would result from the helicopter sites being moved on a regular basis. Cutting of vegetation could result in species change over time, and wetland vegetation degradation would continue as a result of foot traffic.

Upland Vegetation

The byproduct of Alternative C, the continued propagation of walking trails to and from stations, may degrade existing upland vegetation. Several sites are adjacent to hardwood hammocks, and in one case the trail to the station leads through a hardwood hammock in the Loop Unit of the Preserve. As the landing site is moved to different locations as conditions degrade in one site, multiple impacts will be realized as more trails are created.

Fish and Wildlife

Trails to and from stations have the potential to disrupt the natural wildlife habitat. At one station, foot access trails cross a large game trail, and the deeper trails at several of the older stations, create unnatural habitat for fish, reptiles, and amphibians by ponding water for longer periods of time than the surrounding land.

Special Status Species (Threatened, Endangered, and Rare Species)

Habitat for species of special status is present near many of the hydrology monitoring stations. Alternative C would not have a considerable impact on any federally endangered, threatened, or candidate species, initially. The impact on state-listed species would also be negligible in the short term. Long term effects would be the continued degradation of habitat by continued use of long trails, and establishing new trails when old ones become unusable.

Local and Regional Economy

Since Alternative C would not affect the existing aviation services contract, there would be no benefit or detriment to the local or regional economy.

Preserve Operations

Alternative C would require additional staff time and funds to manage activities. Maintenance activities, clearing of vegetation, and additional helicopter trips to complete activities would be necessary.

Visitor Experience

Alternative C would not affect visitor experience considerably. Visible trails at monitoring stations would not be a departure from current landscape feature unless expansion of foot trails made it so.

Analysis of this alternative compared to the Proposed Action

The proposed action would inflict fewer impacts on the surrounding environment than Alternative C, because this action would continue the use trails to and from monitoring stations. These trails would also require restoration when abandoned, and would require establishment of new trails periodically.

Analysis of this alternative compared to the No Action Alternative

While resource degradation would continue under Alternative C as in the No Action alternative, there would still be no access to sites during high water conditions. When sites could not be accessed for sampling during such high water conditions, water quality data loss would be irretrievable.

Cumulative Impacts

The cumulative impacts of Alternative C would result from the incremental nature of the Alternative. Over a period of time, new landing sites would need to be created, new trails to and from the monitoring stations would be created, and previous landing sites would be abandoned. The impacts would be continued degradation of soil, vegetation, and water quality.

Alternative D: Mounded Earth landing sites

Soil and Water Quality

Importing fill, even sterile fill to build raised earth platforms for landing the helicopter during the wet season would expose the soil and water to various contaminants under Alternative D.

Wetlands, Hydrology, and Vegetation

Several of the monitoring stations and their helicopter landing sites are in marshy areas and ponds, and where trails have been worn in the soil, changes in vegetation are evident. Hydrologic changes due to channelization of flow in trails are suspected to be significant, and studies are currently proposed to quantify the breadth of the impact on Preserve hydrology.

Where fill would be used to create raised landing platforms, localized impacts to sheetflow would occur. Loss of wetlands would be on the order of 10 square yards per site for the actual size of the pads, but that would not encompass the area impacted by driving through the wetland to deposit the material, construct the pad, and move the heavy equipment for construction activities.

Upland Vegetation

Alternative D would create unnatural upland soil mounds, where establishing native plant communities would be difficult. Efforts would have to be taken to manually control the establishment of exotic species, such as Brazilian Pepper. Chemical control of exotic vegetation would be inappropriate, since water quality samples are collected and analyzed for the presence of pesticides and herbicides at these sites.

The continued need for trails to travel from the landing site to the monitoring station would continue to present the opportunity to degrade upland vegetation and soils as a result of trampling and repeated foot traffic.

Fish and Wildlife

Alternative D would create unnatural wildlife habitat conditions as well as affecting current habitat. Construction activities would temporarily disturb wildlife, and would permanently

affect (by removing) some possible wetland species habitat. Artificial upland habitat would also be created.

Special Status Species (Threatened, Endangered, and Rare Species)

Habitat for species of special status is present near many of the hydrology monitoring stations. Alternative D would not have a considerable impact on any federally endangered, threatened, or candidate species, initially. The impact on state-listed species would also be negligible in the short term. Long term effects would be the continued degradation of habitat by continued use of long trails, and establishing new trails when old ones become unusable as well as the creation of a small area of unnatural habitat, as well as removing the area of the fill pad from biological production.

Local and Regional Economy

Contracting and construction related employment and expenditures would temporarily benefit the local economy, but there would be little long term effect.

Preserve Operations

Alternative D would require additional staff time and funds to manage activities and ensure safety of staff and visitors. Contracting and contract oversight would be required, as well as costs associated with the construction contract and purchase of fill material. Planning and compliance, as well as on-sight monitoring would also be necessary to complete this project.

Visitor Experience

Alternative D may adversely affect park visitors as unnatural features would be created, altering the natural landscape. These landing sites would be more visible to visitors in the backcountry and those on designated trails, several of which are close to monitoring stations. Disturbance to or disruption of visitor experience during construction would also occur.

Analysis of this alternative compared to the Proposed Action

The proposed action would inflict fewer impacts on the surrounding environment than Alternative D. This alternative would create an artificial upland, which would increase the potential for exotic plant establishment, and degrade existing wetland conditions. This action would continue the use of a set of trails to and from monitoring stations, which would continue to degrade soil, vegetation, and water quality.

Analysis of this alternative compared to the No Action Alternative

While resource degradation would continue under Alternative D as in the No Action alternative, the benefit would be access to the stations during all water level conditions. Importing fill and thus providing opportunities for exotics invasion under Alternative D would result in greater environmental impact than the no action alternative.

Cumulative Impacts

The cumulative impacts of Alternative D would result from the incremental nature of the Alternative. Over a period of time, new trails to and from the monitoring stations would still need to be created, and previous trails would be abandoned. The impacts would be

continued degradation of soil, vegetation, and water quality in those trails and the creation of an artificial upland environment, which could provide opportunity for invasion by non-native plant species.

Alternative E: Engineer - designed parking pads (Preferred Alternative)

Soil and Water Quality

Alternative E would temporarily expose soil and water to various contaminants during the construction phase. These potential impacts could be mitigated by building the structures during the drier months of the year, and monitoring water and soil quality.

Wetlands, Hydrology, and Vegetation

Several of the monitoring stations and their helicopter landing sites are in marshy areas and ponds, and where trails have been worn in the soil, changes in vegetation are evident. Hydrologic changes due to channelization of flow in trails are suspected to be significant, and studies are currently proposed to quantify the breadth of the impact on Preserve hydrology.

Alternative E would have impacts on hydrology and vegetation in the short term, during construction, but would have benefits in the long term. The raised parking pad would be hydrologically invisible, boardwalks would reduce trail wearing to and from stations, and there would be no long term effect on native vegetation.

Upland Vegetation

Alternative E would have negligible impact to upland vegetation, since no unnatural habitat would be created. The decking is not suitable for vegetation growth, and since the surface is porous, it will allow water, air, and sunlight to pass through to the ground beneath.

Fish and Wildlife

The construction activities proposed would temporarily degrade habitat but is not anticipated to have an impact to native fish and wildlife conditions over the long term since further degradation of habitat will be limited.

Special Status Species (Threatened, Endangered, and Rare Species)

Habitat for species of special status are present near many of the hydrology monitoring stations. Alternative E would have a negligible impact on any federally endangered, threatened, or candidate species, except during initial construction activities. The impact on state-listed species would also be negligible except in the short term during construction.

Local and Regional Economy

Contracting and construction related employment and expenditures would temporarily benefit the local economy, but there would be little long term effect.

Preserve Operations

Alternative E would require additional staff time and funds to manage activities and ensure safety of staff and visitors. Contracting and contract oversight would be required.

Planning and compliance, as well as on-sight monitoring would also be necessary to implement alternative E.

Visitor Experience

Alternative E may adversely affect park visitors as unnatural features would be created, altering the visual landscape. These landing sites would be more visible to visitors in the backcountry and those traveling along designated trails in the backcountry, several of which pass in close proximity to monitoring stations.

Analysis of this alternative compared to the No Action Alternative

Alternative E would be preferable to the No Action Alternative, since it mitigates long term impact on the surrounding environment. It improves safety and time-efficiency of sampling, without affecting the environment or placing undue burden on staff and budget resources over the long term. After initial establishment of pads and walkways, the water quality impact would be minimal, and the impact to soils and vegetation would be reduced dramatically. Trail impacts that have occurred under the no action alternative could also be restored, providing further benefit to the local area.

Cumulative Impacts

The cumulative impacts of this alternative would result from the long term management required to provide upkeep for the helipads. They would need to be inspected periodically, and possibly replaced after 15 – 20 years. Alternative E balances the short-term need of access and monitoring program expansion with the long term goals of ecosystem health, biodiversity, and sound resource planning. It also provides the benefit of ceasing currently occurring impacts.

SUSTAINABILITY AND LONG TERM MANAGEMENT

Any Adverse Impacts that Cannot Be Avoided Should the Action Be Implemented

Analysis of the Proposed Action

The proposed action is a model for sustainable management of monitoring programs in a natural area of national significance. However, implementing the proposed action would result in unavoidable effects to vegetation and soils within the footprint of the helipad. Plan implementation could result in the shading of vegetation, possibly changing the vegetation growing beneath the pads. Soils would be displaced initially during construction and re-deposition of soils could take many years, although eliminating trails on unsuitable substrate would limit additional soil displacement and compaction.

Analysis of No Action (Continue Current Management)

Implementing the no action alternative (continue current management) would result in unavoidable adverse effects to surface water flows, water quality, soils, vegetation, and wildlife, including threatened and endangered species. Difficulties of sampling events would also persist under the no action alternative. Holding time constraints would also limit sampling activities.

Localized disruption of surface water flows would occur because of rutting caused by foot traffic.

Adverse water quality effects would include an increase in the area impacted by turbidity and re-suspension of nutrients or other chemicals bound in the soil.

Soils would become increasingly compacted, and would be subject to erosion. In some heavily used areas, soils could be completely displaced and the limestone cap rock would be exposed. Soils disturbances would become more widespread over time.

Degradation of protected species habitat would continue, and the potential for human disturbance of protected species would increase.

The Relationship between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Analysis of the Proposed Action

Activities associated with the proposed action would be consistent with a long-term management strategy for ensuring the protection and restoration of natural and cultural resources.

Alternative E, engineer designed parking pads would reduce the spatial extent of soils and vegetation that would be affected by monitoring activities in the Preserve. Endangered species, including the Florida panther and Cape Sable seaside sparrow, may benefit by reductions in the area of their habitat impacted by human disturbance.

Analysis of No Action (Continue Current Management)

Implementing the no action alternative would result in adverse impacts to the long-term ecological health of the Preserve. This would occur from the increased spatial extent of the impacts related to monitoring activities. Vegetation and soils are expected to experience the greatest spatial increase in impacts from the continuation of current practices, with water quality impacts not far behind.

The ability of the Preserve to provide suitable habitat to support the endangered Florida panther and Cape Sable seaside sparrow may also be adversely affected. Because of the endangered status of both of these species, any adverse effects could put their continued existence in the Preserve at risk.

Any Irreversible or Irretrievable Commitments of Resources that Would Be Involved Should the Alternative Be Implemented

Analysis of the Proposed Action

None of the natural resource or visitor experience changes associated with the proposed action would be considered irreversible or irretrievable commitments, however the energy and materials expended during construction would be an irretrievable resource commitment.

Analysis of No Action (Continue Current Management)

The no action alternative may result in irreversible or irretrievable commitments of the preserve's soil, water, and vegetation resources.

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